

NON-PUBLIC?: N
ACCESSION #: 9006260003
LICENSEE EVENT REPORT (LER)

FACILITY NAME: St. Lucie Unit 1 PAGE: 1 OF 4

DOCKET NUMBER: 05000335

TITLE: Manual Reactor Trip following Severe Leakage of Main Turbine
Digital Electro-Hydraulic Control Fluid Due to the Installation
of Improperly Sized O-Rings
EVENT DATE: 05/24/90 LER #: 90-007-00 REPORT DATE: 06/23/90

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 091

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: Sandra C. Mead, Shift Technical Advisor

TELEPHONE: (407) 465-3550

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: EA COMPONENT: BKR MANUFACTURER: W120
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On May 24, 1990 St. Lucie Unit 1 was in Mode 1 at 91% power performing main turbine maintenance on a hydraulic control valve (Moog) in the Digital Electro-Hydraulic (DEH) Control System on the #3 Governor valve. When DEH fluid was re-established to the valve, an excessive unisolable leak developed. The Assistant Nuclear Plant Supervisor instructed the Reactor Control Operators to manually trip the reactor and turbine at 0452. The Standard Post Trip Actions were performed and the unit was stabilized in Mode 3, Hot Standby.

The initiator of this event was the severe leakage of DEH fluid from the associated Moog valve of the #3 Governor valve. An investigation revealed the o-rings inside the base of the Moog valve which seal this

valve to the #3 Governor valve mounting plate had ruptured. The cause of the rupture was due to the installation of improperly sized o-rings. The parts list used to obtain replacement o-rings for maintenance had the incorrect part number listed for these o-rings. The root cause for this event is inadequate tech manuals and drawings for the DEH system which lack the part numbers for replacement pads.

An official parts list was requested from the vendor for all o-rings used on the turbine/generator set, as well as all other supporting Westinghouse systems. The o-rings on all similar valves were inspected to ensure the correct o-rings were installed. A drawing change request has been submitted to have the o-ring part numbers put on the appropriate drawings.

END OF ABSTRACT

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DESCRIPTION OF THE EVENT

On May 24, 1990 St. Lucie Unit 1 was in Mode 1 at 91% power performing main turbine maintenance on a hydraulic control valve (Moog) in the Digital Electro-Hydraulic (DEH) Control System (EHS: TG) on the #3 Governor valve (EHS: JJ). The leak had been discovered at 0150 and Instrument and Control (I&C) personnel were called out to effect repairs. The unit was downpowered at 0205 to 95% in order to close the #3 Governor valve and isolate the leak. The plant was brought to 91% power and I&C personnel began troubleshooting. Investigation of the leak resulted in the discovery of a failed o-ring on the Moog valve. All the o-rings were replaced with new ones of the identical size and part number of those removed. The system was turned over to Operations when repairs were completed.

At 0450, Operations re-established DEH fluid to the #3 Governor valve. Within ten seconds, high pressure DEH fluid began issuing from the valve. This information was conveyed to the control room. Due to the severity of the leak and the relatively inaccessible location of the isolation valve, there appeared to be no way to isolate the leak before the DEH fluid reservoir drained. This would result in an eventual loss of the DEH trip header pressure and an automatic reactor trip. At 0452, the Assistant Nuclear Plant Supervisor instructed the Reactor Control Operators to manually trip the reactor and turbine. Standard Post Trip Actions were performed.

The trip was an uncomplicated reactor trip with all safety functions being met. However, the 1B-1 6.9 KV bus (EHS: EA) did not automatically

transfer from the Auxiliary to the Startup Transformer (EIS:EA), as it is designed to do. This resulted in the loss of the 1A2 and 1B1 Reactor Coolant Pumps (RCPs) (EIS:AB) and the 1B Main Feedwater Pump (MFW) (EIS:SJ) which are powered from this source. The 1A and 1B Auxiliary Feedwater Pumps (AFW) (EIS:BA) were started by the RCO to provide feedwater to the Steam Generators (S/Gs) (EIS:AB). A few minutes later, the Auxiliary Feedwater Actuation System (AFAS) (EIS:JE) timed in and auxiliary feedwater auto-initiated, as was expected due to the steam generator shrink phenomena post trip.

The Standard Post Trip Actions were completed and the diagnosis of an uncomplicated reactor trip was made. The 1 B-1 6.9 KV Startup Transformer breaker was manually closed in without any problems. Both "B" side powered RCPs, 1A2 and 1B1, were restarted. The 1A MFW Pump was used to supply feedwater to the S/Gs. The 1A, 1B, and 1C AFW Pumps were secured. The unit was stabilized in Mode 3, Hot Standby.

CAUSE OF THE EVENT

The initiator of this event was the severe leakage of DEH fluid from the associated Moog valve of the #3 Governor valve. An investigation revealed the o-rings inside the base of the Moog valve which seal this valve to the #3 Governor valve mounting plate had ruptured. The cause of the rupture was due to the installation of the improperly sized o-rings. The parts list used to obtain replacement o-rings for maintenance was a hand written one, compiled from various sources because the part numbers were not included in the vendor tech manual or on the vendor drawings. This parts list had the incorrect part number listed for these o-rings. The root cause for this event is the lack of an adequate tech manual and drawings for the DEH system, which should have the part numbers for replacement parts listed.

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ANALYSIS OF THE EVENT

The plant response during this trip was observed to be normal. All systems functioned as designed with the exception of the plant equipment mentioned previously.

This event is reportable to the NRC under 10CFR50.73(a)(2)(iv) as any event or condition that results in a manual or automatic actuation of the Reactor Protection System.

The event was bounded by that described in Section 15.2.7.2.1 of the St. Lucie Unit 1 FUSAR. The initiating event is a ramp closure of the

turbine control valve with the reactor at full power

The actual plant

response was much more conservative than that described in the analysis for several reasons: 1) The reactor trip was manually initiated prior to exceeding any protective setpoints. 2) Had the plant not been manually tripped, the reactor would have tripped on "Loss of Load" prior to the "High Reactor Coolant System Pressure" trip assumed in the FUSAR. 3) The plant was not at full power when this event occurred.

The 1B-1 6.9 KV bus automatic transfer from the Auxiliary to the Standup Transformer failed to occur as it is designed to do. During this event, the 6.9 KV bus 1 B-1 deenergized and the Startup Transformer breaker failed to close in. The 6.9 KV Standup Transformer breaker was manually closed in without any problem. The cause for the failure of the Standup Transformer breaker is believed to be due to the existence of a trip free condition. Troubleshooting efforts by plant maintenance personnel and the repair vendor could not pinpoint the root cause of failure for this newly installed breaker. There is no equipment required for the safe shutdown of the plant which is powered off the 1 B-1 6.9 KV bus. The RC Ps are not required for the safe shutdown of the plant as natural circulation flow will ensure adequate decay heat removal. However, the 1A1 and 1B2 RCPs remained running during this entire event, providing forced circulation to aid in decay heat removal.

Auxiliary Feedwater was initiated and provided feedwater to the S/Gs post trip. The S/G water levels did not go below 50% wide range level, therefore the capability of the generators to act as a primary heat sink was never in jeopardy.

From the analysis of the event, all safety functions were met and maintained. Thus, the health and safety of the public was not endangered at any time during the event.

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CORRECTIVE ACTIONS

- 1) I&C has requested an official parts list from the vendor for all o-rings used on the turbine/generator set, and all other Westinghouse systems.
- 2) I&C has submitted a plant change request to Plant Engineering to have the o-ring part numbers put on the drawings.
- 3) I&C inspected all similar valves on Unit 1 to ensure the correct o-rings were installed.
- 4) I&C submitted a Plan Work Order to inspect the o-rings on the Unit 2 turbine valves during the next outage.

5) Electrical Maintenance, System Protection and a repair vendor attempted to re-create the failure of the 1B1 6.9 kv Startup Breaker.

6) The 1B1 6.9 kv Startup Breaker was replaced and shipped offsite to a repair vendor for testing.

ADDITIONAL INFORMATION

Failed Component Identification

Component: 1B-16.9 KV Startup Transformer Breaker #30202
Westinghouse Porcel-line Type DHP Magnetic Air Circuit
Breaker
Model #75DHP500-2000A

Previous Similar Events:

LER #389-85-003 describes a similar plant trip at St. Lucie. While performing maintenance on the digital portion of the Unit 2 DEH Control System, a spurious "close Intercept valves" (CIV) signal resulted in the closing of all four Intercept valves which shut off steam flow from the high pressure turbine to the low pressure turbine and caused the moisture separator reheater relief valves to lift. The CIV signal did not reset properly; the intercept valves cycled open and closed several times over the next minute. The result of this valve cycling was a loss of secondary water inventory. The control room operators elected to manually trip the reactor before an automatic trip on low steam generator water level occurred.

ATTACHMENT 1 TO 9006260003 PAGE 1 OF 1

P.O. Box 14000, Juno Beach, FL 33408-0420

FPL JUN 21 1990

L-90-217
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Gentlemen:

Re: St. Lucie Unit 1
Docket 50-335

Reportable Event: 90-07

Date of Event: May 24, 1990

Manual Reactor Trip following Severe Leakage of
Main Turbine Digital Electro-Hydraulic Control Fluid due to the
Installation of Improperly Sized O-Rings

The attached Licensee Event Report is being submitted pursuant to
the requirements of 10 CFR 50.73 to provide notification of the
subject event.

Very truly yours,

D. A. Sager
Vice President
St. Lucie Plant

DAS:JWH:kw

cc: Stewart D. Ebnetter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant

DAS/PSL #184

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